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DESCRIPTION

UNIVERSAL AIR CUSHIONING MATERIAL

Technical Field

The present invention relates to a packaging member used when articles to be packed, which are made of medical equipment, various kinds of precision machine components, semiconductor products or glass products and have various shapes, are transported, in more detail, to a cushioning material that is interposed between an article to be packed, which is transported, and a transporting vessel that accommodates the article to be packed to protect the article to be packed from an external force such as an impulse, and in particular to a universal cushioning material preferably used when articles to be packed, which are made of various products and components of which shapes or dimensions are not finite are packed and transported over a long period under different atmospheres.

Background Art

So far, when mass-market products having a finite shape are packed, molded articles of styrene foam have been used. However, as packaging materials or cushioning materials for various applications, newspapers and clothes, chipped styrene foams, bubble films or the like, irrespective of shapes of the articles to be packed, have been conveniently used.

However, in the respective cushioning members, for instance, molded articles of styrene foam are exclusively used for individual products. Accordingly, since these cannot be converted to other applications, after the use thereof, there is no way of use other than discarding. Furthermore, even in the case of the chipped styrene foams, bubble sheets (air caps), newspapers, clothes and the like excellent in the versatility, when these are finally discarded as wastes, these amount a large volume. Accordingly, the above situations are causing problems that cannot be easily overlooked from viewpoints of the recent earth environment protection and the energy saving.

In this connection, recently, a bag-shaped air cushioning material in which two superposed synthetic resin films are heat sealed at an external periphery portion to form into a bag shape and one end thereof is provided at an end thereof with an air injection port having a special check valve function (JP-B-7-117171, pages 1 through 3 and Fig. 2) and an air-matte shaped cushioning material in which inside of the bag-shaped cushioning material line-shaped or point-shaped weld lines are disposed to form a plurality of small air chambers (JP-UM-6-37149, pages 1 through 5, and Fig. 4) have been developed and are already in wide use as a bag-shaped air cushioning material that is made of a thin synthetic resin and in which air is sealed under the pressure in the range of 3 to 5 Kpa/cm². The bag-shaped air cushioning material,

while maintaining the versatility as the packaging material, has excellent characteristics for use in protective packaging of various components and products, gap filling materials of general merchandizes and the cushioning materials of resources. Furthermore, methods of applications are simple, when it is not used it can be folded like a sheet, a space for housing is compact, the waste treatment is readily carried out and the convenience is excellent as well.

As mentioned above, the synthetic resin bag-shaped air cushioning material has excellent characteristics as a replacement of chipped styrene foams and bubble sheets that are used for goods made of various kinds of components and products having various shapes. However, when precision components that have a rectangular or polygonal outer shape and a particular thickness, glass products weak to the impulse or fragile cylindrical or columnar goods and the like are stably packed, accommodated in a transporting vessel and the like and transported under severe conditions, there remains a little concern in the reliability thereof. In order to eliminate the concern completely, an unnecessarily large amount of the bag-shaped air cushioning material has to be used, and thereby a larger size of the transporting vessel is caused. Furthermore, the bag-shaped air cushioning material, in order to fill in various gaps between products to be transported and a packaging vessel, is

desirably individually compact and air is demanded to be sealed at relatively low pressure. Accordingly, there are newly caused problems in that when articles are transported or stored over a long time in a district where a temperature fluctuates largely, for instance, in a cold district, the air pressure of the bag-shaped air cushioning material decreases, on the contrary, in a high temperature district, the bag-shaped air cushioning material explodes to be incapable of functioning as a cushioning material.

In this connection, recently, an air cushioning material that completely wraps goods such as precision components, is located between with a transporting vessel and stably exhibits the cushioning function is variously proposed.

To cite one example, an air cushioning material that, when long air chambers of a synthetic resin air cushioning material having a plurality of long air chambers continued in a horizontal direction are folded into a cylinder and the partially welded portion thereof is folded, finally wraps an entirety of the article to be packed with the air chambers (for example, JP-A-2003-137352, pages 1 through 8 and Figs. 1 through 15) and a winding type air cushioning material where air chambers called follicles continued in a left and right direction are disposed and when air is charged a step is formed at a boundary of the intermediate portion of the air chamber and both ends (for example, JP-

A-2003-63567, pages 1 through 7 and Figs. 1 through 7) have been proposed. In the former one, the cushioning material wraps an article to be packed as a whole, and, in the latter one, steps support a periphery of the article to be packed and wrap or in some cases nip from either side of the article to be packed.

Disclosure of Invention

Normally, when various kinds of products and the like are transported by sea or by air over a long time, these are transported in containers. Since the collapse of cargo in the container is not found apparently, there is fear that a large accident may be caused. Accordingly, sufficient care is required in packaging these and particular attention is paid on the reliability thereof. In this connection, in the air cushioning materials, improvements are not restricted to the above-mentioned ones. In an air cushioning material that is used to inhibit the cargo from collapsing, a double structured one made of an external bag and an internal bag is used. In this case, for example, one in which as the external bag unsunned kraft paper is used and as the internal bag a PE bag is used or one in which as the external bag triply superposed unsunned kraft paper is used and as the internal bag a PE bag is used or PA/PE/PA laminated one is used is used. In all cases, the air cushioning materials that are formed into a pillow shape are in wide use.

When for instance products packaged in a cardboard box or a bike is wrapped with the pillow type air cushioning material and transported, in some cases, a center portion of the air cushioning material, owing to the concentration of the stress, becomes projected. Owing to the projection-like deformation of the air cushioning material, goods such as products may be damaged. Accordingly, a reinforced cardboard is further interposed between an inner wall of a container and the goods to inhibit in advance the damage due to contact of the goods and the container from occurring. However, the reinforced cardboard used is expensive and the suring cost including the reinforced cardboard becomes higher. This is a problem to be urgently overcome. In addition, when used packaging containers are world-widely attracting attention as the waste problem, the air cushioning materials in which many kinds of raw materials are combined are not preferable from viewpoints of recycling nor incineration. Accordingly, a demand for air cushioning materials made of single raw material is strong.

In the invention, in order to overcome problems remaining from existing technologies, a further improvement is applied to the existing technologies. The invention intends to provide an air cushioning material that, in spite of a compact structure, can cope with a variety of articles to be packed. Specifically, the invention intends to form an air cushioning material from

a single raw material and thereby to provide a universal air cushioning material that can package goods made of products or components having various dimensions and shapes, accommodate in a container and stably transport even under very severe conditions.

In order to overcome the above problems, an air cushioning material according to the invention is a universal air cushioning material that is constituted in such a characteristic manner that, in an air cushioning material that is interposed between an article to be packed and an inner wall of a transporting vessel to protect the article to be packed from an outer force such as the impulse, side portions forming end portions of above and below and left and right external frames of two superposed rectangular synthetic resin films made of the same raw material are thermally fused; between the side portions, an intermediate portion thereof is arbitrarily thermally fused in accordance with a dimension and shape of the article to be packed to dispose a plurality of partitioned periphery portions; at arbitrary positions in the vicinity of the side portions of the peripheral portions, at least a pair of notches is disposed horizontally symmetrically in accordance with a dimension and shape of the article to be packed; furthermore, in the periphery portions, at least one air passage port is disposed to form a plurality of mutually communicated air chambers to enable to arbitrarily vary a contact area

between the air chambers and the article to be packed or an inner wall of the transporting container; to at least one of the air chambers an air injection port is disposed to inject air from the air injection port to expand an entirety of the air chambers; and thereby an inside thereof is pressed against the article to be packed and an outside thereof is pressed against an inner wall of the transporting container.

The invention is furthermore characterized in that, in the universal air cushioning material, arbitrary positions of the side portions and remaining portions after notching the notch portions, respectively, are thermally fused in accordance with a dimension and shape of the article to be packed.

The invention is still furthermore characterized in that, in the universal air cushioning material, any one of the remaining portions after notching of the notch portions is thermally fused and the side portions above and below are thermally fused or stitched.

The universal air cushioning material according to the invention is characterized in that a synthetic resin film forming the cushioning material is PE/PE cloth/PE or PP/PP cloth/PP film.

Furthermore, the universal air cushioning material according to the invention is characterized in that, in an air injection port disposed to at least one of the air chambers, a check valve is used.

Still furthermore, the universal air cushioning material according to the invention is characterized in that, in the synthetic resin film constituting a raw material, an antistatic agent is preferably blended.

A universal air cushioning material according to the invention is most characteristic in forming a cushioning material by paying a great attention to shapes and dimensions of goods such as various kinds of products and components that are articles to be packed (hereinafter, in some cases, simply referred to as "goods") and forming the cushioning material itself in accordance therewith. That is, a universal air cushioning material is provided which is indispensably constituted in such a manner that side portions forming end portions of above and below and left and right external frames of two superposed rectangular synthetic resin films made of the same raw material are thermally fused; between the side portions, an intermediate portion thereof is arbitrarily thermally fused in accordance with a dimension and shape of the article to be packed to dispose a plurality of partitioned periphery portions; at arbitrary positions in the vicinity of the side portions of the periphery portions, at least a pair of notches is disposed horizontally symmetrically in accordance with a dimension and shape of the article to be packed; furthermore, in the peripheral portions, at least one air passage port is disposed to form a plurality of mutually communicated air chambers to enable to

arbitrarily vary a contact area between the air chambers and the article to be packed or an inner wall of the transporting container; to at least one of the air chambers an air injection port is disposed to inject air from the air injection port to expand an entirety of the air chambers; and thereby an inside thereof is pressed against the article to be packed and an outside thereof is pressed against an inner wall of the transporting container.

The universal air cushioning material according to the invention is provided with air chambers as mentioned above. Thereby, a contact area between goods to be packed or an inner wall of a transporting vessel (a container or the like) and the air chambers can be arbitrarily controlled. Accordingly, when air is injected from an air injection port disposed to at least one of the air chambers to expand the air chambers and thereby an inside thereof is pressed against the goods and an outside thereof is pressed against an inner wall of the transporting vessel to work as a cushioning material, a broad mutual contact area can be obtained. Accordingly, the stress can be previously inhibited from concentrating and thereby a stable cushioning function can be secured. As a result, to an extent that can flexibly cope with fluctuations of a temperature or pressure, internal pressure can be increased. Accordingly, a function as the cushioning material under severe conditions can be

maintained over a long period.

Furthermore, in the cushioning material according to the invention, when, in accordance with a shape of an article to be packed, for instance, on an arbitrary position on a side surface thereof, at least a pair of notches is disposed horizontally symmetrically and remaining portions after the formation of notches are mutually thermally fused, a substantially horseshoe-shaped cushioning material can be formed. Thereby, with the cushioning material, corners of a rectangular article are not only simply sandwiched with two of the air cushioning materials like in the existing technology but also protected by strongly grasping. When, in addition to the above, edge portions vertically symmetrical are as well thermally fused to form a bottomed cylindrical cushioning material, for instance, bottles can be accommodated. When, without thermally fusing the remaining portions after notching, only edge portions vertically symmetrical are thermally fused or stitched to form a cylindrical cushioning material, cylindrical, columnar or circular articles can be protected.

Thus, in the air cushioning material according to the invention, in spite of being fundamentally simple in the structure, since a magnitude of a synthetic resin film can be arbitrarily varied and periphery portions or notched portions can be arbitrarily changed, a portion or a position that is thermally fused (or stitched) can be

arbitrarily varied in accordance with a shape or a dimension of an article to be packed. Accordingly, literally, a universal air cushioning material that can readily cope with a variety of articles to be packed can be provided. Furthermore, the air cushioning material is packed in a space with a packaging container so as to grasp respective essential portions from side surfaces or up and down and interposed so as to dispose a constant gap between the article and the packaging container. Accordingly, even when a temperature or pressure varies to lower the pressure in the air chambers and thereby a cushioning effect becomes scarce, the article can be protected from the impulse.

In the universal air cushioning material according to the invention, when two films made of the same material, specifically, PE/PE cloth/PE or PP/PP cloth/PP, are superposed and used, an arbitrary position thereof can be freely thermally fused; accordingly, a process such as mentioned above can be realized. Furthermore, being the same raw material, maintenance such as repair can be readily applied and, after the use, it is expected to recycle to effectively use. Furthermore, different from the existing air cushioning material that wraps an article to be packed as a whole, the universal air cushioning material according to the invention, which protects only essential portions, being very compact in its body itself, can be reduced in the cost involving the storage and

transportation in an unused state. Even when it is unavoidably incinerated to dispose, there is no anxiety of generating a poisonous material, and, not only effective use of the resources but also the environmental protection is sufficiently considered.

Brief Description of the Drawings

Fig. 1 is a plan view showing a state prior to forming a cushioning material by injecting air in two synthetic resin films superposed on both sides, which are made of PE/PE cloth/PE that forms a universal air cushioning material involving one example of the invention.

Fig. 2 is a perspective view schematically showing a state where, in the foregoing example, after a universal air cushioning material is formed by injecting air, a substantially rectangular box as an article to be packed is horizontally grasped.

Fig. 3 is a plan view showing a state of a universal air cushioning material involving another example based on the invention prior to injecting air to form a cushioning material (corresponding to Fig. 1).

Fig. 4 is a perspective view schematically showing a state where, after air is injected in the foregoing example to form a bottomed covered cylindrical cushioning material, a wine bottle is accommodated (corresponding to Fig. 2).

Best Mode for Carrying Out the Invention

In what follows, the invention will be more detailed with reference to the drawings. However, the invention is not restricted thereto and within a range that does not deviate from the range of the gist of the invention design can be freely changed.

A universal air cushioning material 1 according to a first example of the invention provides a cushioning material that is used when as an article to be packed 10 a plurality of cardboard boxes each of which has a width of 800 mm, a length of 1200 mm and a height of 420 mm and accommodates precision electronic components therein are stacked and loaded up in a transporting container. As a raw material, a polyethylene film of PE80/PE14 × PE14/PE80 is adopted. As shown in Fig. 1, a plurality of the films are cut in a width of 1600 mm and a length 1000 mm and two pieces of the cut films are superposed, respectively; a side portion 2 that forms an external frame thereof and a periphery portion 3 that is located inside of the side portion 2 and equally divides a lateral direction thereof into eight and a vertical direction into five are formed; furthermore, in a horizontal direction thereof a third step and a sixth step are equally notched inward from side portions 2-3 and 2-4 in a vertical direction to form notches 4; the side portions 2 and the periphery portions 3 thereof are respectively thermally fused and notch remains 4-2 and 4-3 and 4-4 and 4-5 of the notched

portions 4 are respectively thermally fused; and thereby a universal air cushioning material 1 that has two notched portions 4 respectively equally on both horizontal sides and eight mutually communicated air chambers 5 is formed. The universal air cushioning material is provided with an air injection port 6 that has at least one check valve at an arbitrary position of the periphery portion 2 and air is injected from the air injection port 6 so that the internal pressure may be 5 Kpa/m². Thereby, a universal air cushioning material 1 according to the example, which is expanded so as to be a substantial horseshoe-shape, is obtained. In the next place, two universal air cushioning materials according to the example are prepared and, as shown in Fig. 2, an article to be packed 10 is appropriately grasped at both sides and accommodated in a container. A polyethylene resin air cushioning material obtained similarly to the example is subjected as a sample to a load test at a gap of 300 mm and confirmed to withstand weight of 19.537 KN. That is, the universal cushioning material 1 according to the example is confirmed to be able to protect the article to be packed 10 with a sufficient strength.

A universal air cushioning material 1a according to a second example of the invention provides a bottomed covered air cushioning material that is used when a normally commercially available glass wine bottle is packed as the article to be packed 10a with a wooden box

as an external package. As shown in Fig. 3, with a polyethylene film substantially similar to the example 1, both sides of air chambers 5a that are equally divided into eight in a longer direction with periphery portions 3a are notched horizontally symmetrically for every two subdivisions to form four notched portions 4a, remaining portions 4a-6 and 4a-8 thereof after notching (or 4a-7 and 4a-9) are thermally fused and side portions 2a-1 and 2a-2 are thermally fused, followed by injecting air similarly to example 1, and thereby a bottomed substantially cylindrical air cushioning material 1a is obtained. Subsequently, a wine bottle as the article to be packed 10a is inserted in the cylindrical air cushioning material 1a, remaining portions 4a-2 and 4a-4 (or 4a-3 and 4a-5) after notching are superposed and sealed, followed by accommodating into a wooden box, and thereby packaging according to the example comes to completion. In the air cushioning material 1a according to the example, a bottom of the wine bottle is supported with thermally fused remaining portions 4a-6 and 4a-8 after notching (or 4a-7 and 4a-9), a crown cap thereof is supported with sealed remaining portions 4a-2 and 4a-4 after notching (or 4a-3 and 4a-5), portions between the bottom or the crown cap and the wooden box are complemented with air chambers 5a corresponding to side portions 2a-4 and 2a-3, respectively, a side surface thereof is accommodated as if it is wrapped with internal air chambers, and thereby the wine bottle is

confirmed protected by a stable cushioning function.

In a universal air cushioning material 1b according to a third example of the invention, except that side portions 2b-1 and 2b-2 are stitched with a PE sewing yarn, similarly to the example 2, two bottomed cylindrical cushioning materials are prepared, and a cylindrical glass tube is covered with the cushioning materials at both end portions thereof and accommodated in a wooden box. It is confirmed that both end portions of the glass tube are protected similarly to the bottom or crown cap portion of the wine bottle in the example 2, an external periphery portion of the glass tube is provided with a sufficient gap from the wooden box with the cushioning material 1b, and thereby the glass tube is stably protected from an external force such as impulse.

According to another example according to the invention, a raw material of a synthetic resin film that forms an air cushioning material is made of PE 30 μm /PE 30 μm cloth/PE 130 μm . The inside thereof is laminated with PE 130 μm . From the film having a width of 750 mm and a length of 1000 mm, a cylindrical air cushioning material is formed and side portions thereof are stitched with a PE sewing yarn derived from the same raw material. The air cushioning material according to the example is used similarly to that of examples 2 and 3. However, since it is cylindrically formed from the beginning, the compression strength thereof is improved. That is, the

compression strength under the conditions of a gap: 200 mm, an atmospheric temperature: 26 to 70°C and injected air pressure: 5 Kpa/m² (28°C) is 30 Kn and the anti-compression strength as the air cushioning material is 1900 Kn. Furthermore, it is confirmed that the temperature resistance at the time of transporting the container is 70°C or more. That is, a weak point that is caused by thermally fusing the side portions can be eliminated with the cylindrical shape and the anti-compression strength thereof is improved.

In the universal air cushioning materials according to the invention in the respective examples, as the raw material, two pieces of PE80/PE14 × PE14/PE80 are superposed and used. According to the invention, although synthetic resins being superposed are indispensably made of the same raw material, as far as it has the nature in compliance with the above examples, the synthetic resin is not particularly restricted. In view of the maintenance and the problem of environmental protection in the incineration process, PE/PE cloth/PP and PP/PP cloth/PP can be recommended as the most preferable raw materials.

In the universal air cushioning materials in the invention, shapes of the air chambers in the examples are formed substantially rectangular. From the practical point of view, the shape, without restricting thereto, is determined in accordance with a shape of an article to be packed. A shape of the periphery portion as well can be

arbitrarily made circular, semi-circular, or polyhedral and freely selected therefrom. Like this, in the invention, a first feature exists in that in accordance with a shape or a dimension of the article to be packed a shape of the cushioning material can be freely formed. Thereby, an excellent cushioning function is exerted and advantages thereof can be extended from the resource saving and energy saving to a region of the environmental protection.

As another example in the invention, a universal air cushioning material formed with a material obtained by blending an antistatic agent in a synthetic resin film that forms a cushioning material, specifically, in PE/PE cloth/PP or PP/PP cloth/PP, to inhibit an article to be packed from being charged and to inhibit dust from adhering can be proposed as a preferable one. A component that is used as the antistatic agent, as far as it is in the range that can achieve the object of the invention, is not particularly restricted. However, a polymer anti-static agent that can be readily mixed with the polymer polyethylene resin that is a synthetic resin that constitutes a raw material of the universal air cushioning material according to the invention and does not damage the object of the invention, more specifically, polymers having an organic acid, a sulfonic acid, an organic ammonium salt or the like can be preferably selected.

Industrial Applicability

As obvious from the above respective examples as well, in the universal air cushioning materials according to the invention, since, only by injecting air, a form of an inner wrapper is brought into completion, a packaging operation becomes very simple. In addition, in the universal air cushioning material according to the invention, since a cushioning material itself is indispensably formed in accordance with a shape and a dimension of an article to be packed, in particular, irrespective of rectangular and circular products and components, there is no fear of causing a horizontal or vertical displacement with an external vessel such as a container. Together with the cushioning effect due to air, even in the storage and transportation of medical equipment, semiconductor products, and precision devices excellent safety can be guaranteed. Furthermore, two synthetic resin films made of the same raw material are superposed, side portions that form end portions of an external frame thereof and periphery portions that plurally partition an intermediate portion between side portions in a horizontal direction or in a vertical direction are formed by thermally fusing in accordance with a shape and a dimension of an article to be packed, at this time, with an air passage port disposed to the periphery portion, mutually communicated air chambers are disposed, and thereby a contact area between an article to

be packed or an inner wall of a transporting vessel (container and so on) and the air chambers can be arbitrarily controlled. Accordingly, when air is injected in the air chambers to expand and expanded air chambers work as a cushioning material with an inside thereof pressed against an article and with an outside thereof pressed against an inner wall of the transporting vessel, thereby a broad mutual contact area can be obtained; accordingly the stress concentration can be avoided in advance and thereby a stable cushioning function can be secured. Accordingly, since the internal pressure can be raised up to an extent that can flexibly cope with fluctuations of temperature and pressure, a function as a cushioning material under severe conditions can be maintained over a long period. Furthermore, in the universal air cushioning material according to the invention, since, when two films made of the same material, specifically, PE/PE cloth/PE or PP/PP cloth/PP, are superposed and used, an arbitrary position thereof can be freely thermally fused, a process such as mentioned above can be realized. Furthermore, being the same raw material, maintenance such as repair can be readily applied and, after the use, it is expected to recycle to effectively use. Furthermore, even when it is unavoidably subjected to incineration, there is no fear of generating a poisonous material. That is, not only in effective use of the resource but also in the environmental protection, a

sufficient care is paid. In the universal air cushioning material according to the invention, as the raw material, the same synthetic resin film is used and paper and powder are not used. Accordingly, even the humidity in the middle of storage and transportation, the universal air cushioning material can sufficiently withstand.

In the universal air cushioning material according to the invention, when an antistatic agent is blended in a synthetic resin film that becomes a raw material, the electrification of such as static electricity, which is most objected in precision electronic components and medical equipment, can be avoided in advance. In addition, malfunction of devices and adhesion of dust caused thereby can be effectively eliminated. When an advantage of the invention is further mentioned, different from an existing air cushioning material that wraps an article to be packed as a whole or clamps from both sides, the universal air cushioning material according to the invention grasps only essential portions to protect. Accordingly, not only the cushioning material body itself is formed into a very compact structure but also resources used are diminished to the limit. Furthermore, since a cushioning material before use is formed into a thin sheet, the logistic cost involving the storage in an unused state and the transportation can be reduced and the energy saving effect is largely improved. Accordingly, wide applications as the air injection type cushioning material are expected.